

NASA SBIR/STTR Technologies

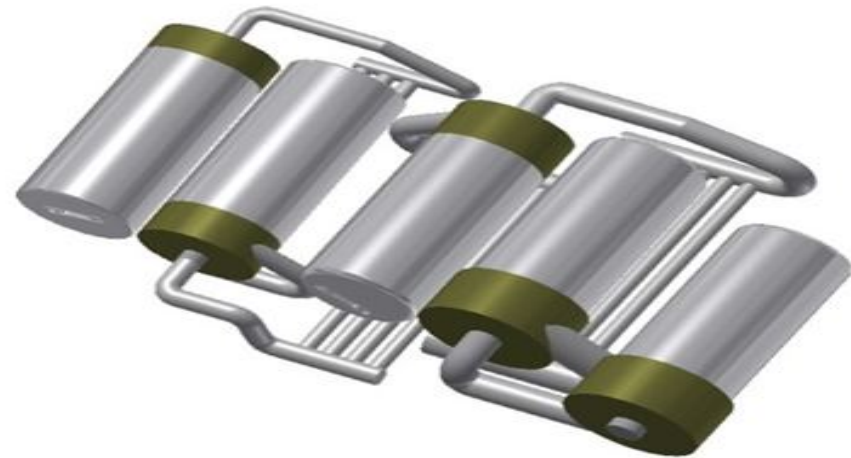
S4.03-9814 - A Miniature Compressor for In Situ Resource Utilization on Mars



PI: Paul Sorensen
Creare, Inc. - Hanover, NH

Identification and Significance of Innovation

A key objective for NASA's next rover mission to Mars is the demonstration of oxygen production from atmospheric carbon dioxide. Such a technology demonstration may pave the way for a future sample return mission to the Red Planet, as well as possibly a future manned mission to Mars. A necessary component in such a demonstration system is a blower or compressor that can deliver the necessary carbon dioxide mass flow to a production plant. Creare proposes the development of a multistage radial flow compressor that is capable of compressing 400 g/hr to a pressure of up to 0.1 Bar. The compressor will be a turbomachine based on our space-qualified vacuum pump technology currently operating on the Curiosity rover in Gale Crater on Mars.



Estimated TRL at beginning and end of contract: (Begin: 3 End: 4)

Technical Objectives and Work Plan

Technical Objectives:

The overall goal of this technology development program is to develop an extremely small, highly efficient, space-qualifiable compressor tailored to meet the needs for ISRU oxygen production from Martian atmospheric carbon dioxide. During Phase I, the project aims to answer the following questions:

1. What are the specific needs for an ISRU compressor?
2. Which compressor design will meet the requirements?
3. Will the compressor design meet the requirements and be cost effective?

Work Plan:

- Task 1. Determine Compressor Requirements and Specifications
- Task 2. Design Radial Flow Compressor
- Task 3. Conduct Impeller Machining Trials
- Task 4. Test Benchtop Compressor
- Task 5. Design Balance of System
- Task 6. Manage and Report

NASA Applications

The primary application for the compressor proposed is to compress Martian atmospheric carbon dioxide as part of an ISRU plant for the Mars 2020 mission. Furthermore, the same technology will be applicable for larger production plants for a Mars sample return and an eventual Mars human mission. This space qualified compressor may also have applications for other planetary missions.

Non-NASA Applications

The potential commercial applications for a small, high-efficiency compressor are numerous. We foresee that this unit will mainly be incorporated in high-value analytical instruments for atmospheric sampling and for systems to detect airborne chemical, biological, and nuclear warfare agents.

Firm Contacts

Paul Sorensen
Creare, Inc.
P.O. Box 71
Hanover, NH, 03755-3116
PHONE: (603) 643-3800
FAX: (603) 643-4657

NON-PROPRIETARY DATA